DOCUMENT RESUME

ED 314 031 IR 014 114

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TITLE New Technologies for Distance Education: A Needs Assessment at the Delivery Site. TDC Research Report No. 4.
INSTITUTION Minnesota Univ., St. Paul. Telecommunications Development Center.
PUB DATE May 89
NOTE 9p.; For other reports in this series produced by the Telecommunications Development Center, see IR 014 111-116.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Adult Education; Distance Education; *Educational Technology; *Extension Agents; Information Technology; Needs Assessment; Nonformal Education; *Organizational Communication; Research Needs
IDENTIFIERS *Minnesota Extension Service

ABSTRACT

This study examined the potential applicability of educational technologies to the Minnesota Extension Service (MES), which delivers non-credit, educational programming to Minnesota citizens through 91 county extension offices in the state's 87 counties. A total of 62 MES field staff members participated in information-gathering meetings where they received a questionnaire examining information and technology aspects of program operations, participated in a group discussion about current methods of information distribution, viewed and listened to videotape and audiotape demonstrations of four new technologies (CD-ROM, audiotex, satellite teleconferencing, and interactive videodisc kiosk), completed a survey on the new technologies, and took part in a discussion of the technologies. Computer communication, educational software, software training, computer-assisted recordkeeping and educational support technology (e.g., voice mail, desktop publishing, and telefacsimile) were also assessed. The study found that most of the technologies have applications for MES staff but that expense, technical demands, and training are barriers to implementation. Tables provide data on methods used by staff for internal communication, methods used for external communication, resources needed by staff, responses to the survey on new technologies, new technology interests, and use of online database services. Areas for further research are suggested. (4 references) (MES)

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MINNESOTA EXTENSION SERVICE
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TDC

TDC Research Report No. 4

May 1989

New Technologies for Distance Education: A Needs Assessment at the Delivery Site

Robert Rubinyi, Carol Scipioni, and Paul Lee

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New Technologies for Distance Education: A Needs Assessment at the Delivery Site

Robert Rubinyi, Carol Scipioni, and Paul Lee*

ABSTRACT

New educational technologies have emerged and are being applied in a variety of settings, including distance education. Which of these technologies will prove to be of value to outreach educators is not fully known. A needs assessment was undertaken among Minnesota Extension Service field staff to determine potential applicability of these technologies at the delivery site -- the local county extension office.

Participants in the study were introduced to four new technologies -- CD-ROM, audiotex, satellite teleconferencing, and interactive videodisc kiosk -- and asked to rate their applicability to the county extension office. Computer communication and educational software, and educational support technology (e.g., desktop publishing, facsimile machine, voice mail, etc.) were also assessed.

The study found that most of the technologies have an application for Extension, but that expense, technical demands, and training provide barriers to adoption and implementation.

INTRODUCTION

The Minnesota Extension Service (MES) is unique as an educational organization in the state. MES delivers non-credit, educational programming to Minnesota citizens through 91 county extension offices in the state's 87 counties. It serves the most rural and the most urban counties, and uses a variety of methods of instruction to educate this vast, distant, and diverse population.[1] Delivery of education occurs one-to-one (e.g., face-to-face conversation or telephone consultation), small groups (e.g., demonstrations), or in larger settings (e.g., extension meetings).

In addition to its county component, Extension has a strong base at the St. Paul campus of the University of Minnesota including faculty and support staff in many disciplines. An important part of the communication and information process is the crucial link between county-based agents and campus-based faculty. One role of these specialists is to assimilate the latest research findings and disseminate them to the public, working in partnership with the local county agents.[2]

MES has made a major commitment to research and development of new technology applications for outreach education. Along with pilot projects and seminars provided by MES's Telecommunications Development Center (TDC), the Educational Development System (EDS) has been moving rapidly to introduce technology innovations to the organization.[3] As a pioneer in microcomputer-based extension applications, MES continues to look toward new educational delivery methods to more effectively and efficiently reach its clientele.

The Minnesota Extension Service is increasingly relying on new technologies for information and communication. For internal communications, county offices have access to the Extend-U computer network which provides electronic mail, newsletters, and messages; computer software for office applications, such as word processing, spreadsheets, and databases; and special application software in all the program areas. (See Table 1.)

Table 1.
Methods Used by County Office Staff for Internal Communication

	Percent
Communication via Extend-U	71.0
Word Processing	69.4
Database management	45.2
Spreadsheets	32.3
Graphics	21.0
Communication to other databases	12.9
Statistics	8.1
Accounting	4.8

The authors are, respectively, MES technology systems leader, TDC technology specialist, and assistant professor; MES information system leader and TDC information specialist; and TDC communications director. Terry Kolomeychuk, former TDC research assistant, contributed to this monograph.

Citation: Rubinyi, R., Scipioni, C., & Lee, P. (1989, May). New Technologies for Distance Education: A Needs Assessment at the Delivery Site. TDC Research Report No. 4. Telecommunications Development Center, Minnesota Extension Service, University of Minnesota, St. Paul, Minnesota.

Table 2.
Methods Used by County Office Staff for External Communication

	Percent
Newspaper column	88.7
County newsletters	87.1
County brochures	85.5
Distribution center publications	79.0
Radio	79.0
Preproduced slide/tape	61.3
Videotapes from distribution center	48.4
Graphics	41.9
County-produced slide/tape	40.3
Television	37.1
Audio cassettes	32.3
County-produced videotapes	24.2
Telephone message machines	4.8

For external communications, the primary method -- after personal contacts -- continues to be the printed word (e.g., bulletins, newsletters, newspapers columns, etc.), radio programs, slide/tape sets, videotapes, television, and audiotapes (in decreasing order) (See Table 2.)

The Minnesota Extension Service has over 1,800 publication titles currently available for distribution, in addition to films, slide sets, videotapes, and computer software. This pervasive use of printed media raises the issue of how to keep these materials current, as well as concerns about production, distribution, and storage of printed materials.

This monograph reports on a technology needs assessment conducted among county extension staff to assist in determining which technologies the Minnesota Extension Service would adopt. TDC, a research unit of the Minnesota Extension Service, served as a resource for this needs assessment.[4]

The premise of this needs assessment is that new technologies can increase effectiveness and/or efficiency in the delivery of outreach education.

METHODOLOGY

During fall 1987, the needs assessment was conducted involving field staff of the Minnesota Extension Service. A total of 62 persons participated in 12 information gathering meetings. The 12 groups represented individuals from 10 county offices, one cluster, and one district.[5] Each of the 12 meetings followed the same procedure and included both quantitative and qualitative methodologies. Individuals in each group:

- received a written questionnaire examining information and technology aspects of program operations.
- participated in a focus group discussion concerning their feelings and opinions on current methods of information distribution.
- viewed and listened to videotape and audiotape demonstrations of four potential new technologies with possible application for the Minnesota Extension Service; completed a written survey concerning their reactions to these technologies; and took part in an open group discussion.

The organizers of the study attempted to select a sample that was representative of the organization considering geographic location, population base, and other related variables. The average age of the respondents was 40, with a mean of 11 years of service in Extension, and approximately two-thirds (63 percent) were female. Those interviewed included county extension agents (44 percent), county extension directors (23 percent), secretaries (24 percent), area agents (5 percent), and others (5 percent). Among the agents, 81 percent reported full-time or partial 4-H appointments, 53 percent agricultural appointments, 39 percent in home economics, and 45 percent with appointments in community development and natural resources (which were a combined administrative unit at the time).[6]

DISCUSSION

Some Basic Concerns About New Technologies

Ely has identified eight educational technology-based elements that tend to make programs less successful, and six elements that make technology-based programs successful . Elements for unsuccessful programs include: 1) confused goals, 2) emphasis on the medium, 3) resistance to change, 4) lack of support systems, 5) lack of skills, 6) expense, 7) lack of quality software, and 8) lack of system focus. Successful technology-based programs are those that: 1) meet critical educational needs, 2) are oriented toward individual learner rather than toward the teacher, 3) are cost effective, 4) have delivery systems that are relatively simple and available, 5) emphasize the design of the system, and 6) are more often involved in training than in education.[7]

Barron found that for distance educational and technology to expand in library and information science education, there is "the need for more funds, both for faculty and technology, for additional personnel to provide logistical support, and for faculty training and education in the area of technology utilization."[8]

Among information technologies, Gayeski suggests that there are some successes (video and visual aids), some failures (broadcast educational television, teaching machines, dial access, videotext, and interactive cable), and some "questionable" technologies (teleconferencing, computer-assisted instruction, interactive video, CD-ROM, and artificial intelligence). Possible reasons for failures include "technophobia," inhibition of human contact, disruption of legal/economic status, lack of appropriate designs and information, technology that doesn't work reliably, other media being better suited, lack of local production ability, and no standardization. Gayeski says what is needed are participatory design, standardization, and local production.[9]

And, Spencer constructed a model for selection of distance education delivery systems for continuing education that includes five components: 1) instructional strategies (e.g., interaction, motivation, attention holding, etc.), 2) access of educational programming at distant sites, 3) complexity of the method for the students, 4) complexity of the method for the provider, and 5) budget/market.[10]

Organizers of the MES needs assessment considered many of these issues in constructing the research questions on new technologies. Interestingly, the first response by most county staff when asked about new technology delivery options was to raise concerns about existing services. Several staff indicated MES should first cover the basics -- good reliable press releases, radio script support, basic computer training, and computer equipment -- before launching new technology initiatives.

Other barriers Extension agents cited that prevented them

from making more use of information and communication technology included lack of time, lack of availability, and lack of training to use new technology and programs. Moreover, lack of time to perform their jobs was cited as the number one barrier for county staff. That concern was listed three times more often than any other factor. (See Table 3.)

Table 3.
County Office Staff: Resources Needed to Perform Job (No. 1 Priority)

	Percent
More time needed for tasks	56.7
Job skills training wanted	20.0
Secretarial support	14.8
Access to information	10.5
Better communication	6.8
Other Resources need (15 mentions)	

The source of funding was a major concern with all of the technologies presented. Several respondents indicated that county boards would need justification for the investment, and others said some applications could be seen as a cost shift to the counties.

This research on new technologies to support MES staff was undertaken in three areas: educational technologies, computer communication and educational software, and educational support technologies. Educational technologies are those used for the direct delivery of educational offerings, including CD-ROM (compact disc - read only memory), audiotex, satellite teleconferencing, and interactive videodisc kiosk. Computer communication and educational software are largely used for internal communications and client consultation, and include the Extend-U network, personal nutrition programs, etc. Educational support technologies are those educators may use to support the delivery of educational offerings, and they include desktop publishing, facsimile machines, etc.

Educational Technologies

In order to assess the potential use of educational technologies, survey respondents were asked to watch and listen to videotapes and audiotapes presenting four new technologies, and to evaluate their potential for use in Extension. Respondents were asked whether the technology would be helpful in serving clients, whether Extension should develop applications, and whether county staff would be willing to commit dollars toward that development. With all the technologies, the responses to the development question correlated directly with perceptions of helpfulness, and support for the technologies dramatically declined when county budgets were affected. (See Table 4.)

CD-ROM. CD-ROM technology permits the storage of 250,000 pages of text information on a single computer searchable disc. The potential CD-ROM application for MES is the production and distribution of a Minnesota Extension Service disc with all MES

Table 4.
Specific Technology Questions

How helpful would the following technologies be for you in serving your clientele?

	Would Help A Lot 1	2	3	4	Would Not Help 5	Mean	Rural Mean	Urban Mean
CD-ROM	22.2	38.9	25.9	5.6	7.4	2.37	2.26	2.67
Audiotex	17.3	46.2	19.2	11.5	5.8	2.42	2.58	2.00
Satellite teleconferencing	11.8	31.4	35.3	11.8	9.8	2.77	2.82	2.62
Interactive videodisc kiosk	7.5	20.8	30.2	24.5	17.0	3.23	3.46	2.57

Should MES develop applications in the following areas?

	Should Develop 1	2	3	4	Should Not Develop 5	Mean	Rural Mean	Urban Mean
CD-ROM	17.0	43.4	26.4	11.3	1.9	2.38	2.23	2.79
Audiotex	17.6	43.1	17.6	17.6	3.9	2.47	2.66	1.92
Satellite teleconferencing	13.7	29.4	29.4	19.6	7.8	2.78	2.84	2.62
Interactive videodisc kiosk	7.5	15.1	28.3	34.0	15.1	3.34	3.59	2.64

Your county would be willing to pay what percent of the cost for the following technologies?

	100% 1	75% 2	50% 3	25% 4	0% 5	Mean	Rural Mean	Urban Mean
CD-ROM	4.2	0.0	35.4	22.9	37.5	3.90	3.82	4.20
Audiotex	0.0	0.0	12.5	35.0	52.5	4.40	4.45	4.22
Satellite teleconferencing	2.5	0.0	12.5	12.5	72.5	4.53	4.58	4.33
Interactive videodisc kiosk	0.0	0.0	2.2	8.9	88.9	4.87	4.91	4.70

publications (more than 1,800), a catalog, and additional research materials (including software for search and retrieval capabilities). Participants ranked CD-ROM first with a mean of 2.37 in helpfulness in serving client needs. (This rating is on a 1-to-5 scale, with 1 being most favored.) CD-ROM was rated more favorable by rural staff, presumably because CD-ROM will allow county offices to maintain fewer publications in the traditionally printed format.

Benefits of the technology according to focus group comments included: search and retrieval capabilities, help for new and seasonal employees, reduction of publications storage space, the ability to insert information from the disc into local publications, and direct client use of the technology.

Audiotex. This technology application was modeled after the INFO-U audiotex system now under testing in Duluth and Rochester. The computerized audio telephone response system permits from four to eight users to access, with a touch-tone telephone, more than 300 audio messages on home horticulture and food preservation.

With a mean of 2.42, audiotex was rated second in being most helpful for serving client needs. Urban staff found this technology more helpful, possibly because of the large number of telephone queries they receive. Suggestions were made to add more topics in agriculture, agriculture policy, and 4-H information.

Rural staff were concerned about the low penetration of touch-tone telephones (which are required for maximum usage of the system), toll calls (unless toll-free lines were used), maintenance of the system, and complex user instructions. Overall, the system was seen as fairly easy to use by most of the respondents.

Satellite teleconferencing. Satellite teleconferencing involves the use of Extension offices, coordinate campuses of the University of Minnesota (at Crookston, Waseca, Morris, and Duluth), vocational/technical institutes, and other locations as downlink sites for Extension programming.

Satellite teleconferencing was rated third with a mean of 2.77. Interestingly, urban extension staff rated it slightly more favorably, even though satellite technology has the potential to delivery programming to remote, rural sites. Positive comments from focus group participants included reduced travel time and increased staff development opportunities. However, county extension staff had concerns about inflexible viewing schedules (unless the program is videotaped for later viewing), technology requirements of staff, relative high cost of production and delivery of high quality programming, and limited interaction between sites.

Interactive videodisc kiosk. The interactive videodisc kiosk proposal is a self-service interactive video information display on home horticulture and food preservation topics to be installed at garden centers, libraries, and related locations.

The least popular of the four technologies, interactive videodisc kiosk received a 3.23 rating. Again, the urban staff saw this technology as more applicable to their environment than did rural staff. The interactive videodisc kiosk could be placed at large, urban grocery stores, nurseries, museums, fairs, cooperatives, and libraries. The high cost of development of interactive videodisc programming was viewed as a barrier.

Video. While not one of the four technologies formally presented during the information gathering meetings, video is becoming an increasingly popular medium among county extension agents. However, participants said the lack of funds to develop video programs is a barrier. Furthermore, respondents said an agreement needs to be reached on a minimal level of video quality (i.e., industrial or broadcast).

When videotapes were not available on a given subject, local county staff said they would consider producing their own. Several staffs requested that training be provided. (Lack of video materials for distribution in MES appears to be a factor encouraging local video production.) Another suggestion was to procure materials produced by other agencies.

Some groups in Extension, such as 4-H clubs, are already using video for home viewing and discussion. Several counties allow clientele to check videotapes out of their offices, or the offices are cooperating with local libraries to provide this service. Distribution of videotapes directly to clientele was ranked highly by participants. (See Table 5.)

Computer Communication and Educational Software

The Extend-U computer network, the electronic dissemination system of the Minnesota Extension Service, has been operating since 1981, providing for more timely and efficient delivery of communications (e.g., electronic mail, newsletters, etc.), other information management functions (e.g., computer conferencing, calendar system, etc.), and on-line computerized information services (e.g., AGNET, USDA, etc.). The Extend staff has provided training and support for hardware and software (both commercially-produced administrative programs and educational software programs developed by Extension).

The survey results of county extension agents and support staff show that computers are heavily used to support internal information flow via communication with Extend-U and for word processing (for producing letters, memos, and reports). (See Table 1.) Computers are used less for database management, spreadsheets, graphics, communication to other databases, statistics, and accounting. The Extend-U system was the leading use of on-line database services, with other on-line services used much less. (See Table 6.)

Table 5.
New Technology Interest

	Percent	Clerical Mean	Non-clerical Mean	Rural Mean	Urban Mean
Desktop publishing	80.6	66.7	86.4	79.5	83.3
Facsimile machine	67.2	50.0	65.1	74.4	27.8
Videotape direct distribution to clients	60.7	44.4	76.7	62.8	77.8
Portable microcomputer	60.7	29.4	72.7	62.8	55.6
Presentation graphics	56.5	27.8	68.2	54.5	61.1
Client access to databases	41.0	27.8	46.5	48.0	22.2
Mobile car telephone	35.5	5.6	47.7	36.4	22.2
Voice mail	32.3	5.6	43.2	31.8	44.4

Table 6.
County Office Staff Use of On-Line Database Services

	Percent
Use Extend-U	69.4
Use AGNET	11.3
Use USDA On-Line	8.1
Use CompuServe	1.6
Use other	1.6

Software training. Participants overwhelmingly rated training as good or very good in their open-ended remarks (about 30 very positive responses). The main concern was the need for advanced training for certain programs, and the need for more training sessions with more hands-on emphasis. One staff member said, "How do we get to the intermediate and advanced levels so we can fully utilize software features and develop applications?"

New staff hired since June 1987 have not received any form of computer training from Extend staff, leaving the training to county staff. Existing staff felt inadequate to train new staff, or have no time to do training. Staff wanted more live training, rather than learning independently from software manuals.

Use of Educational Software. Programs that calculate individual profiles were mentioned as more useful than those that access text from limited databases. Software programs that were easy to learn, fast, and multipurpose were most popular. Staff wanted more training to learn more applications for existing software. Time constraints, inappropriate programs, and limited access to computers were the major reasons for not using educational software programs.

Computer-Assisted Record Keeping. Agents indicated that filling out forms was one of the most time consuming tasks they encounter. They were extremely interested in examining the feasibility of using computer-assisted forms for annual home economics and 4-H reports.

Extend-U. While 71 percent of the respondents had personally used Extend-U, every office visited by the researchers accessed the system. The Extend-U service received high marks for content, especially the weekly newsletters and new releases. Some staff reported technical problems after changes in the system, and others were concerned that the system shifts costs to the county offices (e.g., postage, telephone costs, paper, time, etc.).

County office staff were interested in using the electronic mail service on Extend-U, but they noted the need for a critical mass of users for it to be effective. When some staff used electronic mail, they found their county colleagues often did not check their mail on a regular basis.

County staff have made relatively little use of other on-line services. The most popular was AGNET with only 11 percent of the respondents indicating they had used the service. AGNET was followed by an on-line service of the USDA at about 8 percent use. (See Table 6.)

Educational Support Technologies

Participants in the survey were provided a list of six technologies and asked to rate how helpful they would be in their work. Desktop publishing was rated most helpful with 81 percent. That was followed by facsimile machine, portable microcomputer, and presentation graphics with mid-range support, and mobile car phone and voice mail with the least support. (See Table 5.)

The answers varied depending on whether the staff members were clerical or non-clerical, and whether they were from a rural or urban setting. Non-clerical staff rated all six technologies significantly higher than clerical staff. Rural county extension staff found more value in portable microcomputers, facsimile machines, and voice mail, whereas urban staff indicated desktop publishing, presentation graphics, and mobile car telephones were more important.

RECOMMENDATIONS AND CONCLUSIONS

The pervasive use of print for external communication (and issues surrounding it) creates the opportunity to employ new technologies to reduce the burden on county staff and/or to improve the quality of communications. The application of desktop publishing to production of printed material could help both areas. Exploration of low cost desktop publishing programs utilizing existing hardware in county offices should be a high priority. Additionally, CD-ROM holds promise to reduce the number of printed bulletins, and could address concerns about how current the publication are, as well as concerns about production, distribution, and storage of publications. A CD-ROM disc should be produced with a cost-sharing plan on equipment for pilot county offices.

From the county office perspective, audiotex is one of the most promising of the new technologies (ranking first among urban counties and second with rural). The technology has the potential for reaching large numbers of people at a relatively low cost per person. Audiotex should be developed in the more populated counties first (i.e., Twin Cities, Duluth, Rochester, St. Cloud), and then, if successful, brought into smaller counties.

Satellite teleconferencing is feasible and should be pursued. The programming should also be distributed on videotape for more convenient timing of educational delivery. Extension should work with existing downlink facilities first as the purchase of satellite receiving equipment is unlikely to include contributions from county budgets.

Because of high cost and low rating by rural staff, any potential interactive videodisc kiosk applications should be studied carefully. Kiosks may be appropriate in selected urban areas, but only after more research is done on their appropriateness in Extension.

With the large interest among county staff in expanding distribution of video materials to clients and the high percentage of households with VCRs (over 60 percent), Extension should consider providing additional support in this area. Existing slide/tape sets could be transferred to video. Extension could also provide additional copies of video materials for distribution through county offices and libraries.

The full potential of Extend-U appears yet to be met. Additional on-line services should be explored, and relevant information should be directed to all Extension staff. Increased attention should be given to content and access issues related to Extend-U so that it continues to be a viable electronic information system. Concerning educational software programs, county staff should be involved in the assessment before development is underway to improve effectiveness of application.

While not one of the technologies mentioned in this needs assessment, several counties are employing interactive television. Extension should consider providing additional support in the areas where interactive television systems are already being used by Extension and promote Extension use of other systems.

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RECOMMENDATIONS FOR FUTURE RESEARCH

The technology assessment proved to be a useful vehicle for ascertaining the interests and concerns of Extension staff. Participants listed two major positive aspects to the assessment process. First, the meetings presented them with an opportunity to express opinions, voice concerns, and have questions answered in an open discussion format. Second, participants appreciated the chance to get a "preview" of some of the new technologies Extension was considering for educational delivery.

Based on the positive interest expressed by the county staff and the usefulness of the data collected, technology assessments should be conducted on a regular basis to test new applications and delivery systems on these potential users. Consideration should be given to expanding the technology assessments to include campus-based academic specialists and Extension clients.

Additional research should focus on several of the more promising technologies identified in the report. Specifically, research on CD-ROM should examine questions such as the value of CD-ROM databases in answering agent and client questions, and the role of the search software interface in helping or hindering the location of relevant information. With audiotex, one of the key areas to examine is the user reaction to message content. Can audiotex be used to deliver more complex issue-oriented messages along with more traditional consumer information? Major concerns about satellite teleconferencing include the quality of the materials available from program suppliers and the ability of county staff to promote teleconferences to clients. Since cost was a major concern for interactive video systems, low-cost public access interactive videodisc systems could be piloted to ascertain client response to systems that provide fewer features but are more affordable.

Educational software is also an area that demands further investigation. Basic research questions include issues such as which software programs get used and why, how ease of learning and ease of use affect the perceived value of a program, and what type of programs are most useful to agents (e.g., programs that give personalized assessments to clients vs. text programs)? Other potential barriers to use that could be investigated include time available to learn to use the computer, choice of appropriate software, and accessibility of the computer.

In the training area, several questions arise that may have implications for the implementation of technology in general. Future research could: 1) examine whether most users of technology take advantage of the basic features without learning the more advanced features that might be able to help them solve more complex problems, and 2) evaluate the relative effectiveness of self-paced, course-based, and peer training in learning to use new technology systems.

Electronic mail has become increasing popular in recent years. However, this technology does not seem to receive much use unless a large number of relevant individuals have access to the same system. A major issue for research, then, is whether a "critical mass" of users is required in order for electronic mail to be effective.

In addition, several other technologies should be more closely examined including: video, interactive television, desktop publishing, facsimile machines, and voice mail. Finally, a follow-up study would be useful to examine whether the recommendations contained in the assessment were implemented within the organization.

[1]MES is part of the Cooperative Extension System, the federal extension agency within the U.S. Department of Agriculture

[2]Extension offerings are largely delivered through five programmatic areas: agriculture, home economics, 4-H youth development, community development, and natural resources. The Minnesota Extension Service also develops interdisciplinary programs (i.e., water quality, rural revitalization, and support to farm families) which coincide with initiates developed by the Cooperative Extension System, extension's national agency in the U.S. Department of Agriculture.

[3]EDS is a unit in MES that develops and produces educational materials.

[4]Currently, Extension system leaders for technology and information hold joint appointments with TDC and EDS.

[5] Every county office belongs to a district, an administrative unit, and a cluster, a grouping based on program similarities (e.g., forestry, etc.).

[6] Many extension agents hold appointments in two or more areas.

[7] Ely, D.P (ed.). (1988) Educational Media and Technology Yearbook: 1988. Englewood, Colo.: Libraries Unlimited.

[8]Barron, D.D. (1987, Spring) The Use and Perceived Barriers to Use of Telecommunications Technology. Journal of Education for Library and Information Science, 27(4), 292.

[9] Gayeski, D.M. (1989, February) Why Information Technologies Fail. Educational Technology, 29(2), 9-17.

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